SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) Let A, B, C and C and D be sets. Suppose R is a relation from A to B, S is a relation from B. to C and T is a relation from C to D. Then $(ToS)\, oR = To\,(SoR)$.

(b) Let A, B and C be sets. R is a relation from A to B and S is a relation from B to C. Then $(SoR)^{-1} = R^{-1} o S^{-1}$.

17. Show that if $p \to q$, $q \to r$, $\neg(p \wedge r)$ and $p \vee r$ then r.

18. Solve $s(k) - 4s(k-1) + 4s(k-2) = 3k + 2^k$, $s(0) = 1$, $s(1) = 1$.

19. Solve $x - 4y - 3z = -16$.

$$4x - y + 6z = 16$$
$$2x + 7y + 12z = 48$$
$$5x - 5y + 3z = 0.$$

20. Let G be an undirected graph. Then G is bipartite iff it contains no odd cycle.

APRIL/MAY 2025

23PCA11 — DISCRETE MATHEMATICS

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

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1. Define binary reaction.
2. Define Equivalence reaction.
3. Write the truth table for conjunction.
4. Define Distinctive normal form.
5. What is linear homogeneous recurrence relation.
6. Define permutation.
7. State Cayley - Hamilton theorem.
8. Define Matrix.
9. Define connected graph.
10. Define Euler graph.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Let m be a positive integer with $m > 1$. Show that the relation $R = \{(a,b) / a \equiv b \pmod{m}\}$ is an equivalence reaction on the set of integers.

Or

(b) $f(x) = 2x + 3$ and $g(x) = 3x + 2$ what is the composition of f and g and g and f.

12. (a) Find principal disjunctive normal form for $(p \wedge q) \vee (\neg p \wedge r) \vee (q \wedge r)$.

Or

(b) Construct the truth table of the compound proposition $(p \vee \neg q) \rightarrow (p \wedge q)$.

13. (a) What is the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$?

Or

(b) Find an explicit formula for the fibonnacci numbers.

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14. (a) Using Cayley Hamilton theorem find A^{-1} when $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$.

Or

(b) Using cramer's rule.

Solve $3x - 8y + 10z = 8$

$-x + 10y + 9z = -15$

$2x + 6y + z = 11$.

15. (a) Let G be a graph and U and V be two distinct vertices of G. Show that if there is a $U - V$ walk in G then there is also a $U - V$ path in G.

Or

(b) Prove that a simple graph with n vertices must be connected if it has more than $(n-1)(n-2)/2$ edges.